



COMOPTEVFOR VV&A PROCESS

M&S Workshop
14 November 2001

Surface Warfare M&S Analyst

Objectives

- Starting Point - OTD Desires to Use M&S to Supplement OT&E
- Need Process to Get Concepts from the OTD to the Developer
 - Intended Uses of M&S
 - Functionality and Fidelity Needed
- Need Process to Get Confidence in M&S
 - Verification and Validation
- Need Project Management Discipline

COMOPTEVFOR Guidance

- SECNAVINST 5200.40
 - “COMOPTEVFOR will accredit all models and simulations used to supplement OT&E”
 - Specifies the Products
- COMOPTEVFOR INST 5000.1
 - Specifies the Products
 - Discusses the Process and Standardized Approach

Required Products

- SECNAVINST 5200.40
 - Proponent - VV&A Plan, Implementation, V&V Report,
 - Ensure Config. Mgmt., Data Validity
 - Accreditation Authority - Accreditation Report
- COMOPTEVFORINST 5000.1
 - Proponent - Model Management Plan, Accreditation Package for OT
 - COMOPTEVFOR - Accreditation Plan Input Letter for OT, Report

Required Products, Cont

- TEMP
 - Part III - Simulations Designated, Intended Uses for DT
 - Part IV - Simulations Designated, Intended Uses for OT
 - Part V - Resources (Dollars, Man-Years, Schedule)

Facilitating the M&S Process

- Key methods to accomplish the objectives and facilitate the process:
 - Early Involvement (with PM, Proponent, Developer, V&V and Accreditation teams)
 - Open Communications/ Dialogue - Facilitates the Staffing of Requirements, Acceptability Criteria, V&V Expectations, Accreditation Reports

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Passing documents and email alone will be ineffective.

You must attend meetings together and visit each other's locations, have technical level people meet with the programmers at an informal level.

A level of trust and a working relationship can then be established, and then progress can be achieved.

Example

RAM - rocky at first, then 3 days at China Lake - good relations

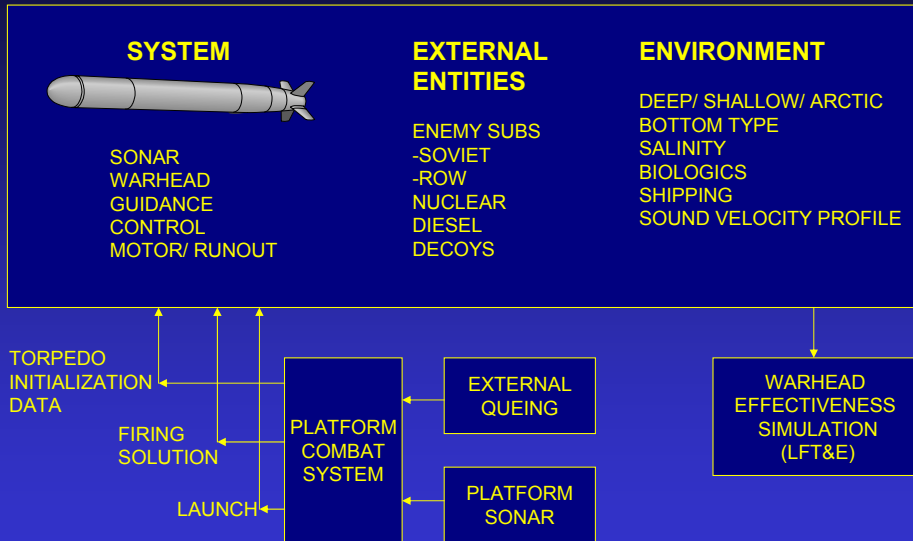
CEC - good project management, working relationship

OTD and techs are able to talk freely about caps and limbs

Example - Hypothetical Lightweight Torpedo

- Define the System
- Determine Operational Requirements
- Project Management of the Verification, Validation, and Accreditation Process

Defining the HLT System



Requirements Letter

A TYPICAL REQUIREMENTS LETTER FROM
COMOPTEVFOR CONTAINS THE FOLLOWING:

- SYSTEM DESCRIPTION - MODEL WILL REPRESENT THE SYSTEM
- INTENDED USES - PRE-TEST PLANNING, PREDICTION, POST-TEST ANAL., “REST OF THE ENVELOPE”
- PROGRAMMATIC ISSUES AND RECOMMENDATIONS FROM PAST LESSONS LEARNED
- GENERAL REQUIREMENTS
- VV&A DOCUMENTATION REQUIREMENTS

Requirements Letter Continued

- STATEMENT OF NEED FOR INFORMATION ASSURANCE
- SUPPORT REQUIREMENTS - FACILITIES, TIME, MANPOWER
- LIST OF COIs, MOEs, THAT CAN BE SUPPORTED BY M&S, REQUIREMENTS SUPPORTING EACH, AND PROPOSED MODEL
- LIST OF DRAFT TEST SCENARIOS
- LIST OF SIMULATION RUNS TO SUPPORT DRAFT TEST SCENARIOS

Requirements Letter Continued

THIS LETTER, GENERATED BEFORE MILESTONE B, IS CRITICAL IN DEFINING THE SCOPE OF WORK REQUIRED TO SUPPORT RESOLUTION OF COIS BUT ALSO HELPS PROGRAM MANAGERS TO BUDGET AND PLAN FOR M&S.

IT SHOULD BE REALIZED THAT THIS LETTER IS INPUT TO THE PROGRAM MANAGERS ACCREDITATION PLAN AND DOES NOT CONTAIN DETAILED TECHNICAL PERFORMANCE REQUIREMENTS THAT THE PM MAY WANT TO SUPPORT TRADE STUDIES AND EVALUATE PRELIMINARY DESIGN PERFORMANCE.

REQUIREMENTS FROM THIS LETTER + PMs TECHNICAL REQUIREMENTS = BASELINE REQUIREMENTS FOR THE ACCREDITATION PLAN.

Designating Simulations

- PM Designates
 - Based on DT and OT Requirements
 - (Vice Selecting Before Establishing Requirements)
- COMOPTEVFOR Does Not Designate
 - Is a Programmatic Decision
- PM Designated Simulations Entered Into Part III (DT) and Part IV (OT)

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Example - May select a simulation that represents CEC (WASP).

If you are concerned with bandwidth and data clipping, then WASP is inappropriate as it has T-1 lines between units

Acceptability Criteria

- COMOPTEVFOR as AA is Responsible
- Developers are Most Knowledgeable
- Must be a Team Effort
- Early Working Relationship is Instrumental
- Must Agree on Metrics
 - abs value, %, expected response, engineering judgement
- Review as a Team
- Incorporate Criteria into V&V & A Plans

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Example - simulation output follows the actual data well, except for one data point, do you reject it? - Probably not.

Example - the simulation output follows the actual data well, except for a region of instability of the actual system, where the simulation is a straight line, do you reject it? - Yes! The simulation must characterize the actual system. In this case, preflight predictions or runs exploring the performance envelope could indicate success, when the actual flights could become unstable and tumble.

Typically have high level acceptability criteria in the accreditation plan, and more detailed criteria in the V&V plans.

Now it is time to move on to the the VV&A plans themselves

Other Issues

- Accrediting Targets, External Entities
 - Drones
 - Digital Representations of Targets
 - Representation of Enemy Units
- Accrediting Community Used Simulations
 - Endgame Simulations
 - Environment Representation
- Accrediting Legacy Simulations
 - Case by case basis

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Targets and external entities - must be accredited, the process is being formalized

Community used simulations - COMOPTEVFOR is working on how to achieve this and minimize the burden on the PMs

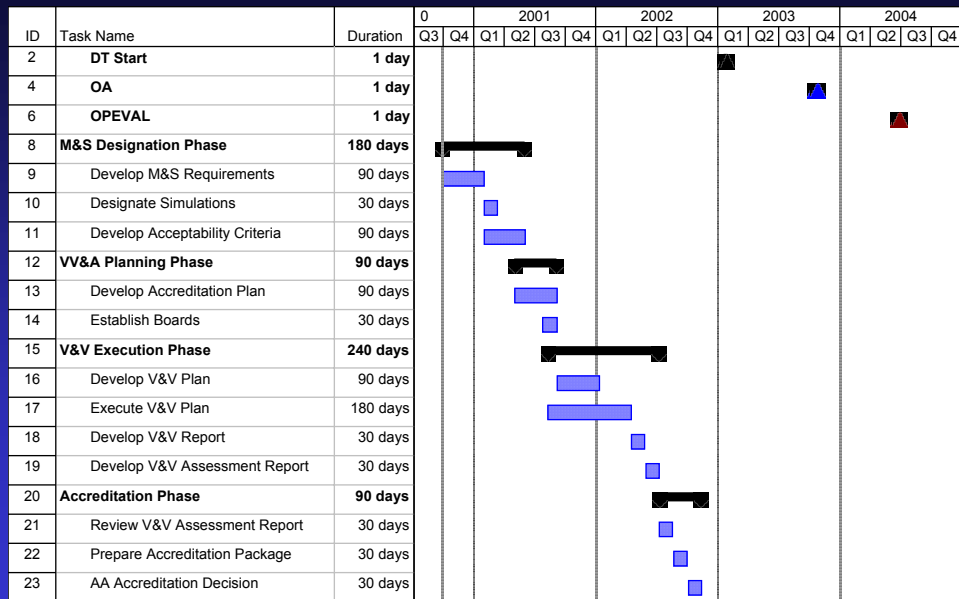
Legacy simulations - Extent of V&V is dependent on application, body of evidence, community acceptance, etc.

Model Management Plan

- Required by COMOPTEVFORINST 5000.1
- Purpose
 - Apply Project Management Disciplines
 - Identify Organizational Roles
 - Identify Resources Required

If Management Disciplines are addressed elsewhere, then they do not necessarily need to be here. A schedule and resources is still important.

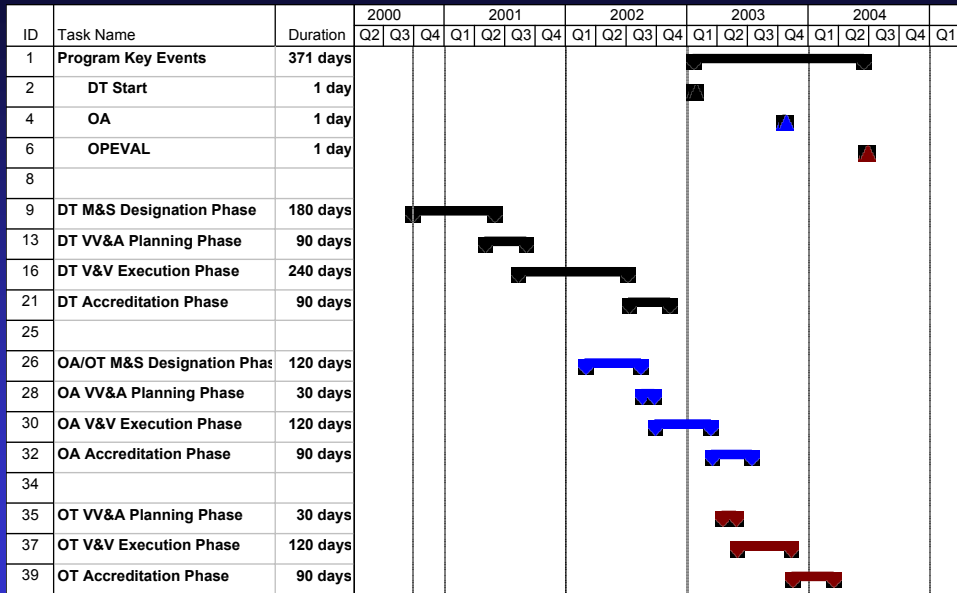
Notional VV&A Project Schedule



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VV&A 'Spiral Development' Schedule



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TEMP Part V

TYPES OF RESOURCES	OT-IIA	OT-IIB PHASE I	OT-IIB PHASE II
TEST ARTICLES			
TEST SITES AND INTRUMENTATION			
TEST SUPPORT EQUIPMENT			
TEST TARGETS/ EXPENDABLES			
FLEET TEST SUPPORT			
OPERATIONAL FORCE TEST SUPPORT			
SIMULATIONS AND MODELS			
WAF	AS REQU'D	AS REQU'D	AS REQU'D
SPECIAL REQUIREMENTS			
MANPOWER AND TRAINING			
COMPUTER SUPPORT			
POST OT-IIIA DATA HANDLING			

V&V Report/ Accreditation Report

- Proponent Responsible for V&V Report
 - Review at Technical and Managerial Boards ending up with V&V Assessment Report
- COMOPTEVFOR Responsible for Accreditation Report for OT (PM for DT)
 - Incorporates V&V Report Data
 - PM sends as a package with certification letter to COMOPTEVFOR

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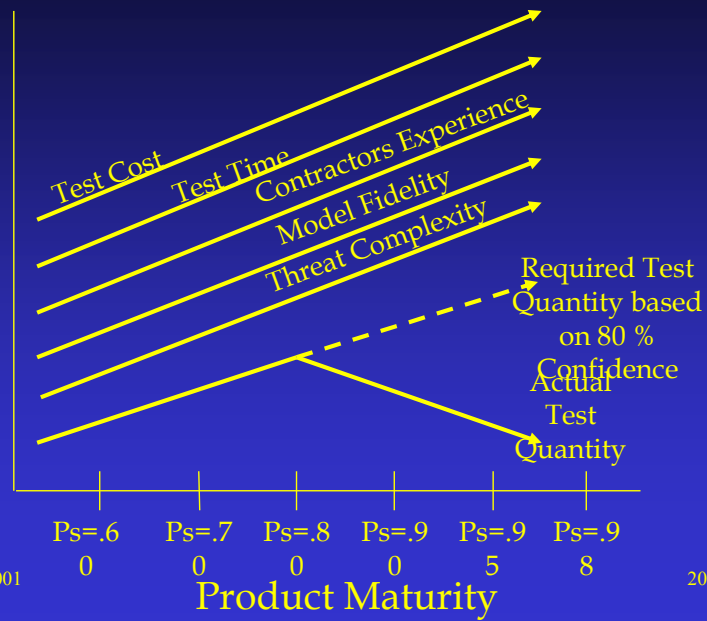
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If PM and COMOPTEVFOR have been working together in
requirements
acceptability criteria
V&V plan

Then the execution and reports will be anti-climatic

If the requirements and acceptability criteria are poorly done, then the execution will be problematic, and fidelity and functionality may not be met and the designated simulations may be inappropriate, or require extensive re-coding, jeopardizing the schedule.

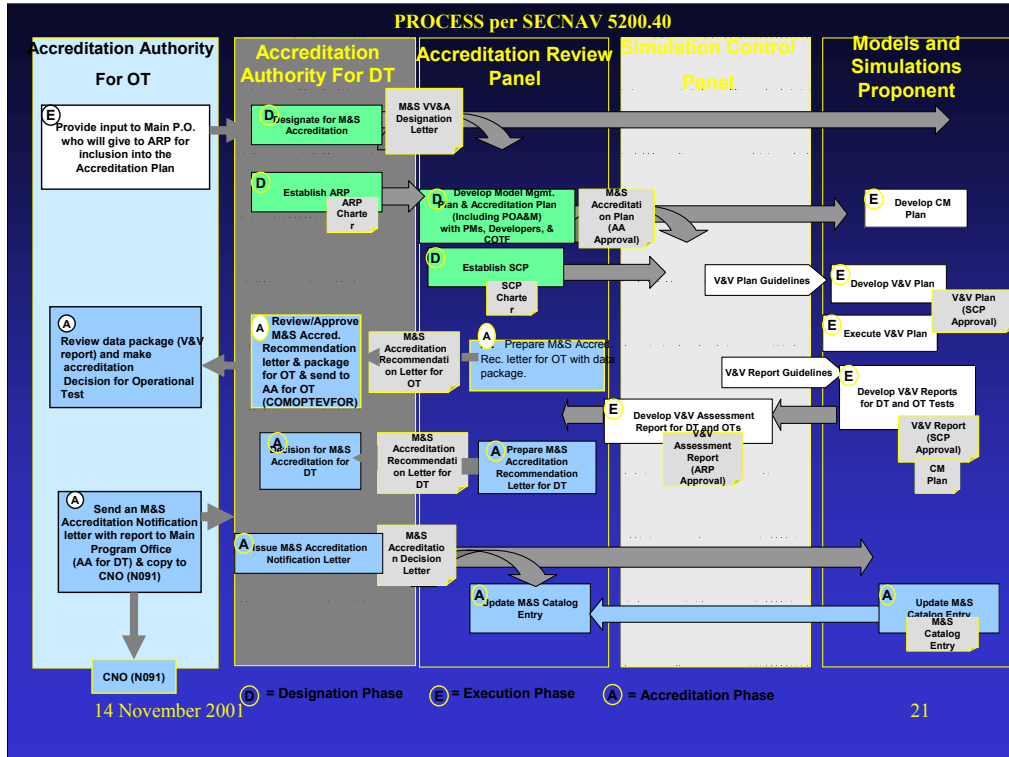
Now will move onto the project management aspects

Critical
Factors

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PROCESS per SECNAV 5200.40





When?

ACCREDITATION PROCESS SCHEDULE PER SECNAV 5200.40

TASK	PHASE A CONCEPT	PHASE B SYSTEM DEV. AND DEMO	PHASE C PRODUCTION & DEPLOYMENT	FRPD- FULL RATE PROD. DEPLOYMENT
PLANNING ORGANIZING		Mgmt. / Process, Model Description, OT Req. Input, VV/A, Config. Mgt., All Plans in place by start of Phase B		
BOARD & TECH MTGS.			Periodicity	
Verification & Validation TASKS	Validate Concept, verify functional models and system models, validate results, Software Design Doc., User's guide, Programmers' manual, CM Plan, Data documents, Progress reported at critical Program reviews - IPR, PDR, CDR, SSR, etc.		Monthly? Quarterly?	
Simulation Runs		Test Planning, Pre-Test Prediction and Analysis, Assess and evaluate performance not proven by test, Post-Test Analysis		
DT / IOT&E		DT IOT&E		
AA for DT Accreditation letter & proof to COTF		AA for DT Accred. Letter & Letter to COTF w/VV&A Pkg.		
COTF (AA for OT) letter of accreditation & Report			COTF (AA for OT) letter(s) of accreditation & Reports	
LRIP DECISION				
TECH / OP.			TECH OPEVA	
AA for DT Accreditation letter & proof of VV&A			AA for DT Accred. Letter & Letter to COTF w/VV&A Pkg.	
COTF (AA for OT) letter of accreditation & Report				AA for OT letter(s) accred. & Reports
Full Rate Prod.				FOT&E



What “accredited” Means in Operational Test

- Accredited for a Specific Use
- Accredited for a Particular Phase or Test Event
- Accredited for a Specific M&S Version
- High Confidence in Output Results of M&S
- Supplement OT&E Only (Does Not Replace)
- M&S Must be Re-Accredited for Follow-on Tests, Newer Versions of M&S, or Major Upgrades to Weapons System
- A model is - Digital, HIL, Land Based Test Systems, Targets (threat rep. Or surrogate), Target sims./stims. Or any combination



Cost Savings?

- No direct cost savings for new M&S
- No direct cost savings for new M&S
- No direct cost savings for new M&S



How Much does it cost?

- Scientists and Programmers' Cost - ?? As high as X% of total program cost?
- Verification, Validation, and Accreditation and the paper documentation required by Department of Defense require a significant % of total program cost.
- Each program is unique - Do detailed cost estimate. Place in TEMP Part V as resource requirement.



Benefits of M&S?

- Cost Avoidance - designers and testers catch problems early “before” going to test. Allows a problem solution early. Costs \$1 to solve early, costs \$10 or more to solve late.
- Possible Future Savings - Legacy M&S may cost less to modify for a new revision of an existing design.
- Practical Necessity - As Cost/Time/complexity constraints dictate less testing, M&S is the only alternative to boost confidence.



- Joint Accreditation Support Activity, (JASA)
- Center for Naval Analysis (CNA)
- John Hopkins University (JHU/APL)
- Old Dominion University Research Foundation
- Threat Systems Office (TSO) China Lake, CA
- Naval Surface Warfare Center Dahlgren Div.
- Naval Research Laboratory (NRL)
- Others

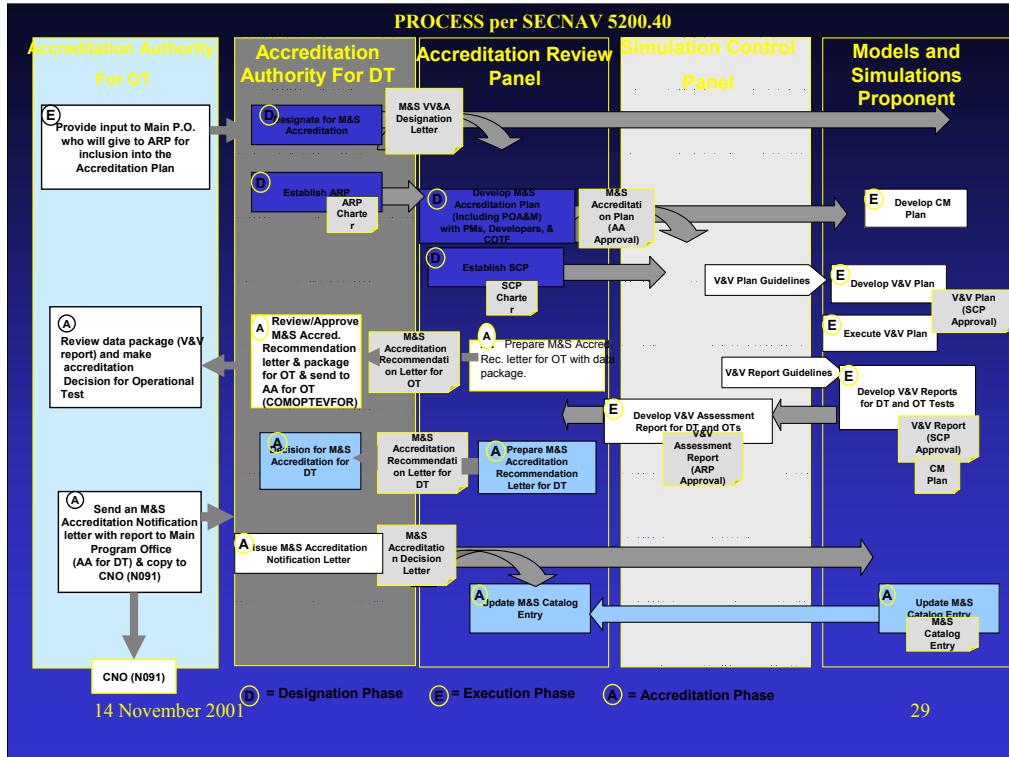


Why Simulate?

Critical Factors



PROCESS per SECNAV 5200.40





COMOPTEVFOR

Surface Warfare Programs

- Tomahawk
- Navy Area and Theater Wide
- CEC
- RAM
- Pra (Both Navy wide & LPD-17)
- LAM/LAM FCS (ALAM)
- ESSM
- ERGM
- TAKE
- AEGIS
- DD-21 Related
- Various Radar (SPQ-9B & others)
- CIWS